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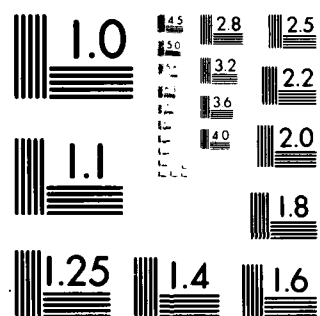
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NATIONAL DAM SAFETY PROGRAM, AMWELL NUMBER 2 DAM (NJ00522), DEL--ETC(U)
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DELAWARE RIVER BASIN
TRIBUTARY OF ALEXAUKEN CREEK
HUNTERDON COUNTY, NEW JERSEY

AMWELL NO. 2 DAM

NJ 00522

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PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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24 JUL 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Amwell No. 2 Dam in Hunterdon County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Amwell No. 2 Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 19 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. The following actions should be initiated within six months from the date of approval of this report:

(1) The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

(2) The embankment should be thoroughly inspected by a professional consultant engaged by the owner. Based on the inspections, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the seepage and other possible causes of embankment instability, including the steep downstream slope and mounded soil at the toe, should be determined and implemented.

Honorable Brendan T. Byrne

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AMWELL NO. 2 DAM (NJ00522)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 19 November 1979 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Amwell No. 2 Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 19 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. The following actions should be initiated within six months from the date of approval of this report:

(1) The owner should develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

(2) The embankment should be thoroughly inspected by a professional consultant engaged by the owner. Based on the inspections, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the seepage and other possible causes of embankment instability, including the steep downstream slope and mounded soil at the toe, should be determined and implemented.

(3) The owner should assure himself that the dam has an outlet works (low level drain) in functional condition and of adequate capacity.

(4) All adverse vegetation on the embankment should be removed and animal holes filled.

(5) Debris in the spillway discharge channel should be removed.

(6) The left training wall of the spillway discharge channel should be repaired or replaced.

(7) Because of the embankment condition a detailed topographic survey of the dam and area around the dam based on N.G.V.D. should be made. The survey map should become part of the permanent record.

c. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED:

James G. Tom
JAMES G. TOM

Colonel, Corps of Engineers
District Engineer

DATE:

19 JUN 1980

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Amwell No. 2 Dam, NJ00522
State Located:	New Jersey
County Located:	Hunterdon
Drainage Basin:	Delaware River
Stream:	Trib. to Alexauken Creek
Date of Inspection:	November 19, 1979

Assessment of General Condition of Dam

Based on visual inspection, past operational performance and Phase 1 engineering analyses, Amwell No. 2 Dam is assessed as being in poor overall condition.

Based on investigations of the downstream flood plain made in connection with this report, it is recommended that the hazard potential classification be downgraded from high to significant.

Hydraulic and hydrologic analyses indicate that the spillway is inadequate. Discharge capacity of the spillway is not sufficient to pass the designated spillway design flood (SDF) without an overtopping of the dam. (The SDF for Amwell No. 2 Dam is equal to one-half the probable maximum flood.) The spillway is capable of passing approximately 9 percent of the probable maximum flood or 18 percent of the SDF. Therefore, the owner should in the near future engage a qualified professional engineer experienced in the design and construction of dams to perform more accurate hydraulic and hydrologic analysis. Based on the findings of the analyses, the need for, and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

Extensive seepage and other indications of possible instability in the dam were observed. Therefore, the dam embankment should be thoroughly inspected soon by a professional engineer experienced in the design and construction of dams. Based on the inspection, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the seepage and other possible causes of embankment instability, including the steep downstream slope and mounded soil at the toe, should be determined and then implemented.

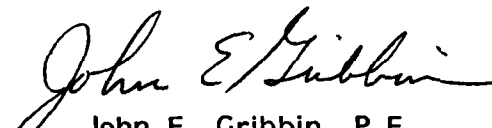
In addition, it is recommended that the following remedial measures be undertaken by the owner in the near future:

- 1) If it exists, the outlet works should be investigated and restored to a functional condition. If no outlet works exists, an adequate low level lake drain should be designed and installed.
- 2) All adverse vegetation on the embankment should be removed and animal holes filled.
- 3) Debris in the spillway discharge channel should be removed.
- 4) The left training wall of the spillway discharge channel should be repaired or replaced.

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

A detailed topographic survey of the dam and area around the dam based on N.G.V.D. should be undertaken by a qualified licensed land surveyor or professional engineer in the near future. The survey map should become part of the permanent record mentioned above.


Richard J. McDermott, P.E.


John E. Gribbin, P.E.



OVERVIEW - AMWELL NO. 2 DAM

29 NOVEMBER 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

AMWELL NO. 2 DAM, I.D. NJ00522

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Amwell No. 2 Dam was made on November 19, 1979. The purpose of the inspection was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

Amwell No. 2 Dam consists of an earth embankment with a concrete wall running along the upstream face. A spillway consisting of a concrete, two-stage overflow weir is located at the west end of the embankment and oriented at 45° to the crest of the embankment. The dam which is oriented approximately east/west has an overall length of 285 feet. The top width of the embankment varies from 10 to 17 feet and the downstream face has a slope of 1.5 horizontal to 1 vertical. The spillway has an overall length of 20 feet and outlets into a chute-type discharge channel.

The elevation of the dam crest is 170.0, National Geodetic Vertical Datum (N.G.V.D.) while that of the toe is 150.8. The height of dam is 19.2 feet. The primary crest elevation of the spillway is 167.5 while the secondary crest elevation is 167.9.

b. Location

Amwell No. 2 Dam is located in the Township of West Amwell, Hunterdon County, New Jersey. Constructed across a tributary to Alexanken Creek, the dam impounds Amwell No. 2 Lake. Principal access to the dam is by an unimproved road north of the dam. The dam can be reached from Route 202 by travelling north on Mt. Airy Road to Station Road; then northeast on Station Road for approximately 0.7 miles where the unimproved road intersects on the right side.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	<u>Impoundment</u>	
	<u>Storage (Ac-ft)</u>	<u>Height (Ft.)</u>
Small	< 1000 and ≥ 50	< 40 and ≥ 25
Intermediate	≥ 1000 and < 50,000	≥ 40 and < 100
Large	$\geq 50,000$	≥ 100

HAZARD POTENTIAL CLASSIFICATION

<u>Category</u>	<u>Loss of Life</u> (Extent of Development)	<u>Economic Loss</u> (Extent of Development)
Low	None expected (no permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than a small number	Excessive (Extensive community, industry or agriculture)

The following data relating to size and downstream hazard for Amwell No. 2 Dam have been obtained for this Phase 1 assessment:

Storage: 106 acre-feet

Height: 19.2 Feet

Potential Loss of Life:

Heavily used road is located approximately 2500 feet downstream from dam. Failure of dam could cause loss of life. Two dwellings are located 2000 feet downstream from the dam, adjacent to a downstream lake. The dwellings are approximately 8 feet above the lake. Hydraulic analysis indicates that they would not be inundated as a result of dam failure. However, loss of life is possible.

Potential Economic Loss:

An earth dam is located 2000 feet downstream. Failure of Amwell No. 2 Dam could cause failure of downstream dam and damage to road bridge located 2500 feet downstream from dam in question.

Therefore, Amwell No. 2 is classified as "Small" size and "Significant" hazard potential.

d. Ownership

Amwell No. 2 Dam is owned and maintained by Amwell Valley Land Corp., 80 Park Street, Montclair, New Jersey 07042.

e. Purpose of Dam

The purpose of the dam is the impoundment of a lake for recreation.

f. Design and Construction History

Amwell No. 2 Dam reportedly was constructed in 1920 to 1923. In 1955 it was reportedly washed out and subsequently rebuilt. No records of the original construction or the reconstruction in 1955 are available.

g. Normal Operational Procedures

Reportedly, no regular maintenance or operational procedures are performed. The lake does not appear to have an outlet works and reportedly was never drawn down.

1.3 Pertinent Data

a. Drainage Area 0.9 square miles

b. Discharge at Damsite

Maximum flood at damsite Unknown

Outlet works at normal pool
elevation No known outlet

Spillway capacity at top of dam
(Elev. 170.0) 223 c.f.s.

c. Elevation (N.G.V.D.)

Top of dam 170.0

Maximum pool - design surcharge 171.4

Normal pool	167.5
Spillway crest - primary	167.5
- secondary	167.9
Toe of dam	150.8
Maximum tailwater	Unknown

d. Reservoir

Length of maximum pool	2500 feet
Length of normal pool	2100 feet

e. Storage (Acre-feet)

Spillway crest	69 acre-feet
Design surcharge	131 acre-feet
Top of dam (Elev. 170.0)	106 acre-feet

f. Reservoir Surface (Acres)

Spillway crest	11.9 acres
Top of dam (Elev. 170.0)	13.1 acres
Maximum pool - design surcharge	23.1 acres

g. Dam

Type	Earthfill
Length	285 feet
Hydraulic Height	19.2 feet
Side slopes - Upstream	Unknown
Downstream	1.5 horiz. to 1 vert.
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel N.A.

i. Spillway

Type	Uncontrolled concrete overflow weir
Length of weir - primary	8 feet
- secondary	12 feet
Crest elevation - primary	167.5
- secondary	167.9
Gates	N.A.
Upstream channel	N.A.
Downstream channel	Natural stream

J. Regulating outlets

None Known

SECTION 2: ENGINEERING DATA

2.1 Design

No calculations, reports or plans pertaining to the design of the dam are available.

2.2 Construction

No data or reports pertaining to the construction of the dam are available.

2.3 Operation

No records of operation and maintenance of the dam subsequent to construction are available.

2.4 Evaluation

a. Availability

No engineering data pertaining to the dam is available.

b. Adequacy

A list of absent information is included in paragraph 7.1.b.

c. Validity

The validity of engineering data cannot be assessed due to the absence of data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspection of Amwell No. 2 Dam took place on November 19, 1979 by members of the staff of Storch Engineers. A copy of the visual inspection check-list is contained in Appendix 1. The following procedures were employed for the inspection:

- 1) The embankment of the dam, appurtenant structures and adjacent areas were examined.
- 2) Areas of seepage were noted and located.
- 3) The embankment and appurtenant structures were measured and key elevations determined with the use of a surveyor's level.
- 4) The embankment, appurtenant structures and adjacent areas were photographed.
- 5) Depths of water were measured at various locations in the lake.

b. Spillway

The concrete free overflow spillway is located at the upstream side of the west end of the dam. It discharges into a rectangular concrete-lined channel located at the west end of the embankment. A concrete slab walkway spans the discharge channel along the crest of the dam. The concrete surfaces of the notched overflow spillway appear to be in satisfactory condition. Concrete surfaces of the discharge channel appeared to be in fair condition with some large cracks noted. The left training wall at the downstream end of the discharge channel was

tilted into the channel. The spillway discharge channel was observed to be partly obstructed by fallen trees and rotted timbers that had spanned the channel. The timbers did not appear to be a structural component of the discharge channel.

c. Embankment

The embankment is severely overgrown with trees and brush. The crest of embankment is fairly uniform and covered with grass and weeds. The upstream face is covered with brush and trees. The downstream face is covered with grass, weeds and trees varying in caliper up to 18 inches. Two points of seepage, one near each end of the embankment, were observed. Discharge was measured to be approximately 1-1/2 gallons per minute at one point on the downstream face near the west end and approximately 1 gallon per minute at the toe at the east end. Small streams carrying seepage water away from these points appear to indicate that seepage has been discharging for a significant length of time.

The concrete wall on the upstream face of the dam appears to be in generally satisfactory condition. A rough edge was observed along the wall 1-1/2 feet below its top. This could be due to forming at the time of construction. Transverse cracks were observed along the wall at 15 to 20 foot intervals.

Erosion was noted on the downstream face adjacent to the spillway discharge channel. A three-foot high mound of earth was observed at the toe near the center of the dam. The mound could be due to sloughing of the downstream face of embankment.

d. Reservoir Area

The shores of Amwell No. 2 Lake are generally wooded and have an average slope of approximately 5 horizontal to 1 vertical.

e. Downstream Channel

The spillway discharges directly into a tributary of Alexauken Creek which is a well defined stream. Approximately 300 feet downstream it enters a lake impounded by an earth dam approximately 17 feet high. Several dwellings are located on the shore of the lower lake approximately 2000 feet from the subject dam. A road bridge crosses the stream approximately 2500 feet downstream from the dam in question.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in Amwell Lake No. 2 is regulated naturally by discharge over the spillway of the dam. No outlet works are reported to exist and none were observed during inspection.

4.2 Maintenance of the Dam

According to the owner and tenant of the property, there is no program of regular maintenance of the dam and appurtenant structures. The last known maintenance was performed in 1955 after the dam was washed out.

4.3 Maintenance of Operating Facilities

Reportedly, there is no program of regular maintenance of the operating facilities.

4.4 Description of Warning System

Reportedly, no formal warning system is in use at the present time.

4.5 Evaluation of Operational Adequacy

The apparent absence of a functioning outlet works and a maintenance program contributes to a poor operational adequacy of the dam.

The dam was observed to be insufficiently maintained in the following areas:

- 1) Trees and brush on embankment.
- 2) Extensive seepage.
- 3) Debris and fallen trees at spillway discharge channel.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The quantity of storm water runoff that the spillway should be able to pass without an overtopping of the dam is based on the size and hazard classification of the dam. This runoff, called the Spillway Design Flood (SDF), is described in terms of frequency or Probable Maximum Flood (PMF) depending on the extent of the dam size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers, the SDF for Amwell No. 2 Dam falls in a range of 100-year frequency to 1/2 PMF. In this case the high end of the range, 1/2 PMF, is chosen because of the hazard potential associated with the downstream dam and road.

The SDF hydrograph for Amwell No. 2 Dam was computed by use of the HEC-1-DB computer program using SCS triangular hydrograph with the curvelinear transformation. Hydrologic computations and computer output are contained in Appendix 4. The calculated SDF peak inflow for Amwell No. 2 Dam is 1731 c.f.s.

Discharge capacity for the spillway was computed by considering free discharge over the concrete spillway. Hydraulic computations are contained in Appendix 4.

The elevation of the crest of dam varies from 170.0 to 171.0. For purposes of computer input, the top of dam was taken as 170.0. A routing of the SDF through Amwell No. 2 Dam

resulted in an overtopping of the dam by a depth of 1.4 feet. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Reportedly, the dam was overtopped and washed out in 1955 and was rebuilt with a very steep downstream slope. Since then no overtopping has been reported.

c. Visual Observation

No evidence of recent overtopping was found at the time of inspection.

d. Overtopping Potential

As indicated in Paragraph 5.1.a., a storm of magnitude equivalent to the SDF would cause overtopping of the dam by a height of 1.4 feet above the top of the dam. The spillway is capable of passing approximately 9 percent of PMF and 18 percent of SDF with lake level equal to the top of the dam (Elev. 170.0).

e. Drawdown Data

No drawdown computations can be performed due to the apparent lack of outlet works.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The embankment appeared, at the time of inspection to be outwardly stable. However two points of significant of seepage were observed on the downstream side. Also, the slope of the downstream face of embankment was found to be excessively steep and a mound of earth was noted at its toe. An accurate determination of the structural integrity of the embankment cannot be made without further investigation beyond the scope of a Phase I inspection.

b. Generalized Soils Description

The generalized soils description of the dam site consists of recent alluvium composed of stratified materials deposited by streams. The alluvium overlies thin beds of soft shale, colored dull red, with occasional interstratified beds of fine grained sandstone, all dipping gently toward the northwest. The shale bedrock breaks easily into small fragments 1/4" to 1-1/2" in size and is identified as Brunswick shale.

c. Design and Construction Data

Design analysis of structural stability and construction data for the embankment and spillway structure are not available.

d. Operating Records

No operating records relating to structural stability of the dam are available.

e. Post Construction Changes

Reportedly, after the washout in 1955, the dam was rebuilt with a downstream slope of 1.5 horizontal to 1 vertical. However, no records are available.

f. Seismic Stability

Amwell No. 2 Dam is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams," which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if stable under static loading conditions. However, Amwell No. 2 Dam, which exhibits extensive seepage and other indications of possible distress, could be unstable under seismic loading conditions.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Amwell No. 2 Dam is assessed as being inadequate.

The embankment exhibits extensive seepage and possible sloughing on the downstream face. The condition of the dam indicates that the embankment would become unstable if corrective measures are not implemented.

b. Adequacy of Information

Information sources for this study include 1) field inspection, 2) USGS quadrangle, 3) aerial photography, 4) consultation with property leasee. The information outlined is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

- 1) Soils Report
- 2) Plans of the dam
- 3) Structural Design Report
- 4) Hydraulic Design Report
- 5) Reports of post construction
- 6) Maintenance documentation

c. Necessity for Additional Data/Evaluation

Additional data and evaluation is considered necessary in order to assess the structural integrity of the dam.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a., the spillway is assessed as being inadequate. It is therefore recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses. Based on the findings of these analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

The embankment should be thoroughly inspected soon by a professional engineer experienced in the design and construction of dams. Based on the inspections, together with any necessary subsoil, seepage and structural investigations, remedial measures to correct the seepage and other possible causes of embankment instability, including the steep downstream slope and mounded soil at the toe, should be determined and implemented.

In addition, it is recommended that the following remedial measures be undertaken by the owner in the near future.

- 1) If it exists, the outlet works should be investigated and restored to a functional condition. If no outlet works exist, an adequate low level lake drain should be designed and installed.
- 2) All adverse vegetation on the embankment should be removed and animal holes filled.
- 3) Debris in the spillway discharge channel should be removed.
- 4) The left training wall of the spillway discharge channel should be repaired or replaced.

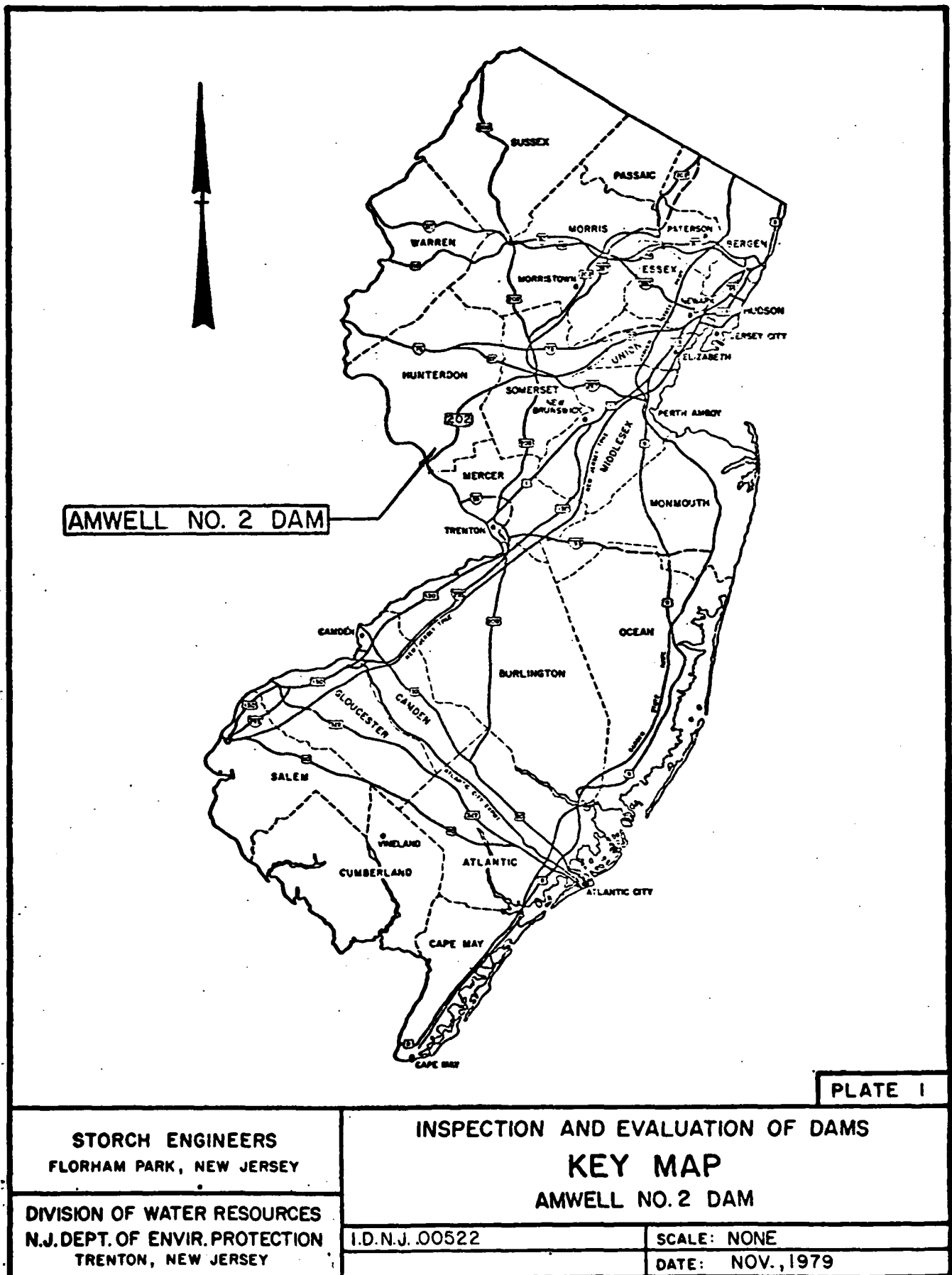
b. Maintenance

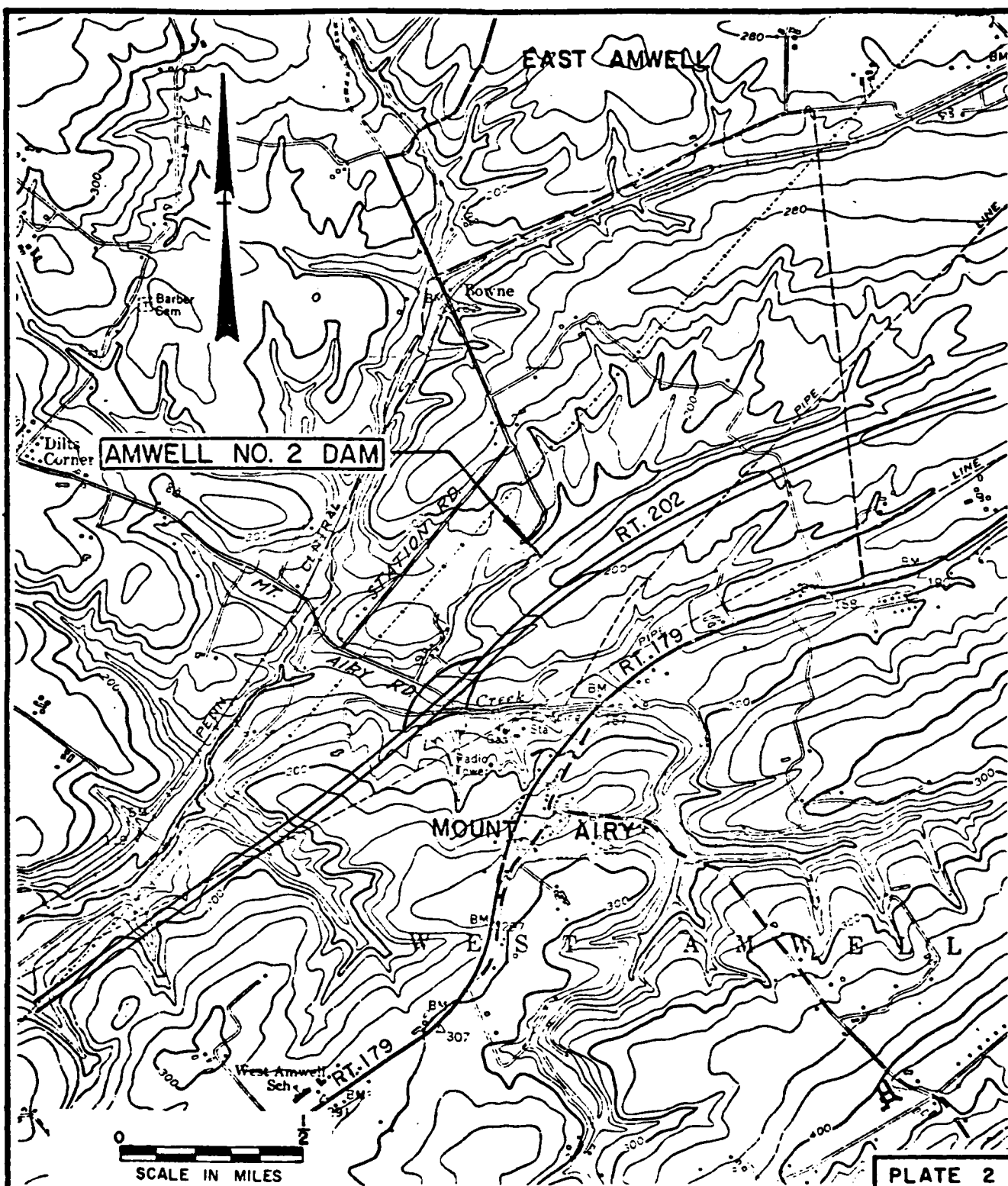
In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

c. Additional Studies

A detailed topographic survey of the dam and area around the dam based on N.G.V.D. should be undertaken by a qualified licensed land surveyor or professional engineer in the near future. The survey map should become part of the permanent record mentioned in paragraph 7.2.b.

PLATES





STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

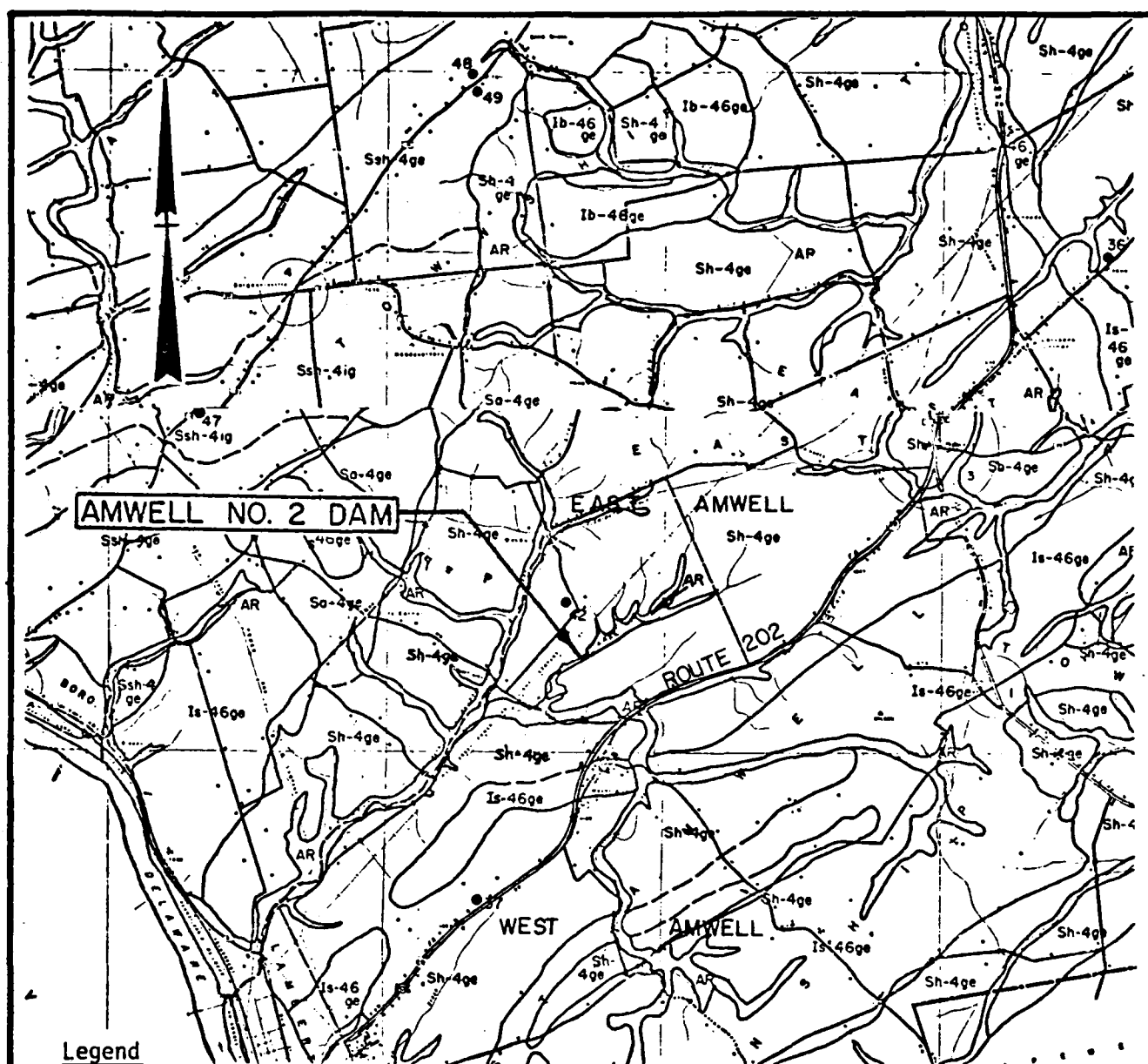
DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
VICINITY MAP
AMWELL NO. 2 DAM

I.D. N.J. 00522

SCALE: AS SHOWN

DATE: NOV., 1979



Legend

- AR Recent alluvium composed of stratified materials deposited by streams.
- Sh-4 Silts with silty clays in the depressions overlying thin beds of soft shale colored dull red.

NOTE: Information taken from Rutgers University Soil Survey of New Jersey, Report No. 6, Hunterdon County, and Geologic Map of New Jersey prepared by Lewis and Kummel.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

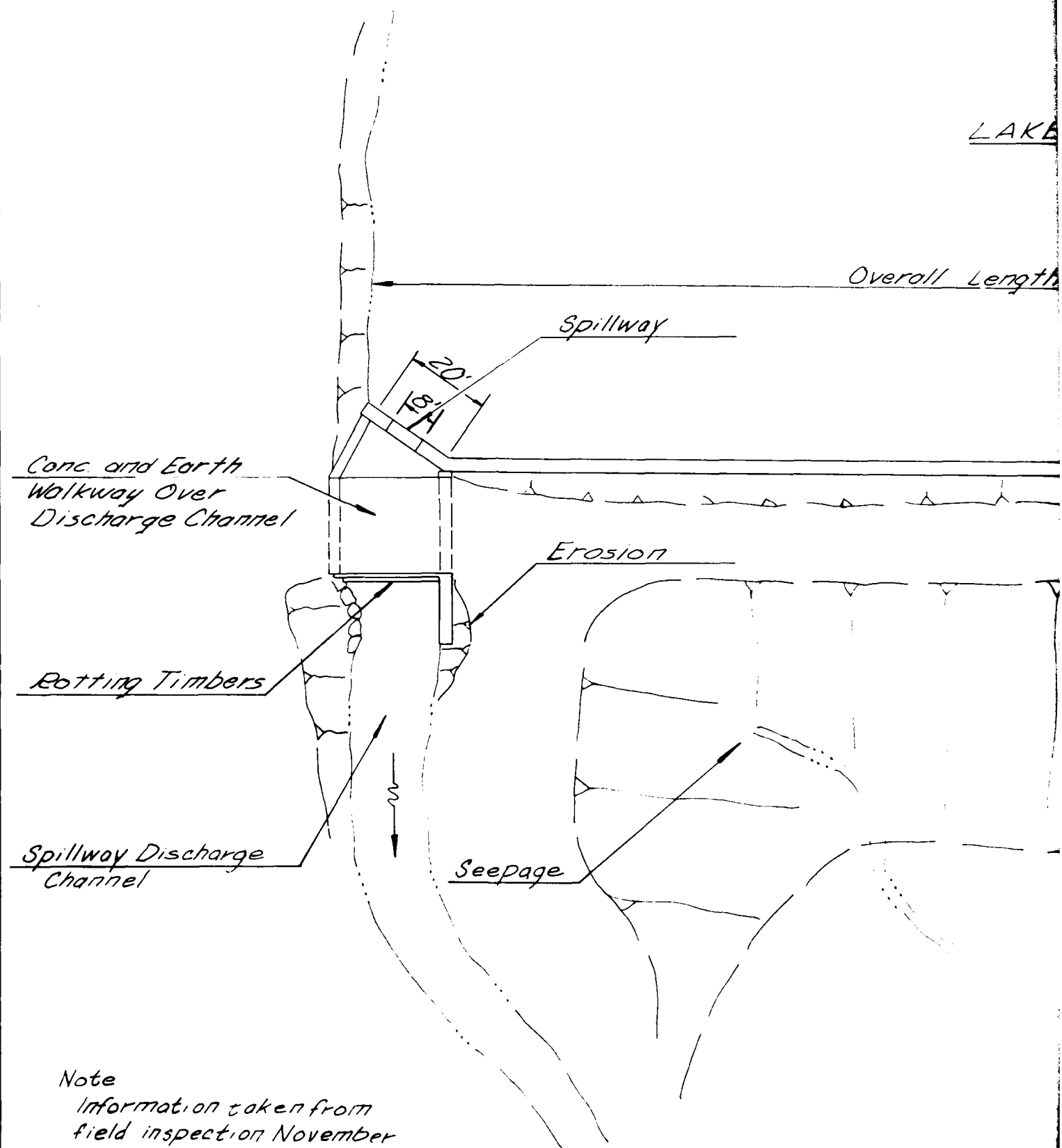
INSPECTION AND EVALUATION OF DAMS

SOIL MAP
AMWELL NO. 2 DAM

I.D. NJ00522

SCALE: NONE

DATE: NOV., 1979



Note

Information taken from
field inspection November
19, 1979.

LAKE



Overall Length of Dam = 285'

Conc. Wall

Crest of Dam

Seepage

PLATE 4

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

GENERAL PLAN

AMWELL NO. 2 DAM

I.D.N.J. 00522

SCALE: NOT TO SCALE

DATE: JAN. 1980

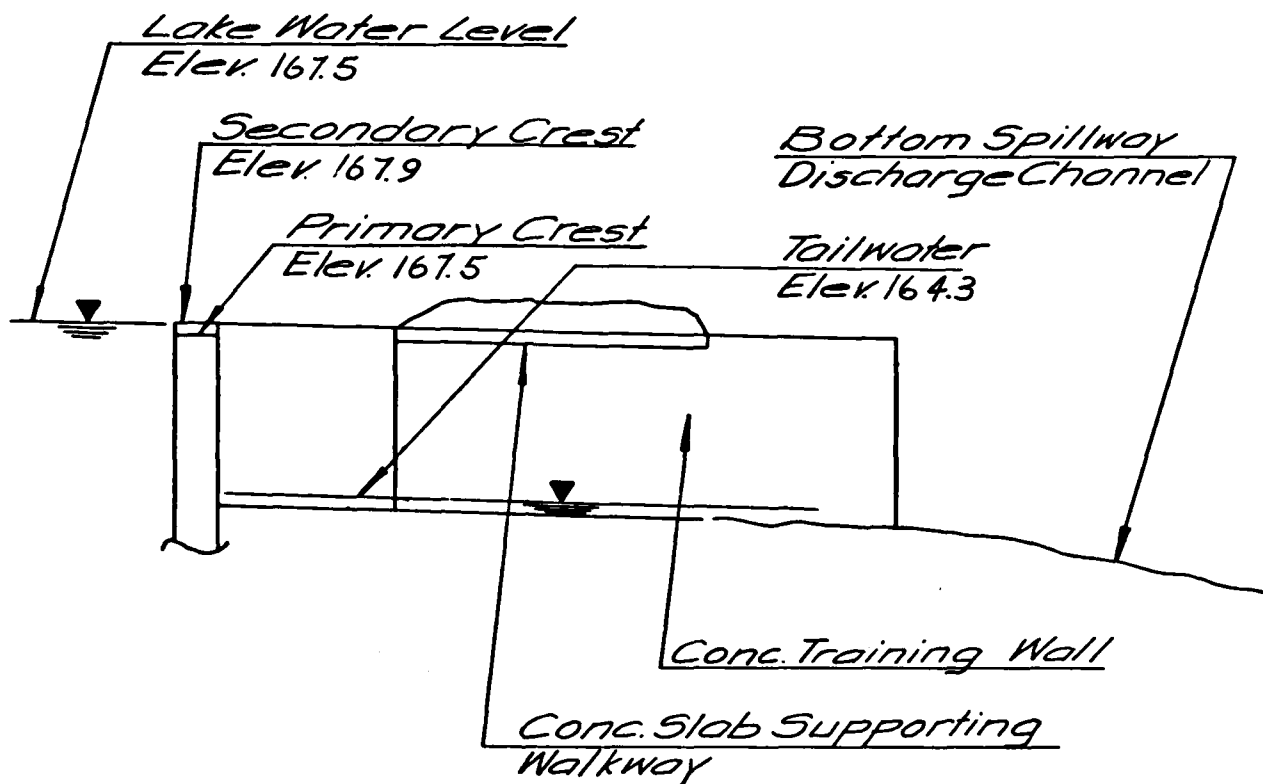


PLATE 5

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

SPILLWAY SECTION

AMWELL NO. 2 DAM

I.D.N.J. 00522

SCALE: NOT TO SCALE

DATE: JAN. 1980

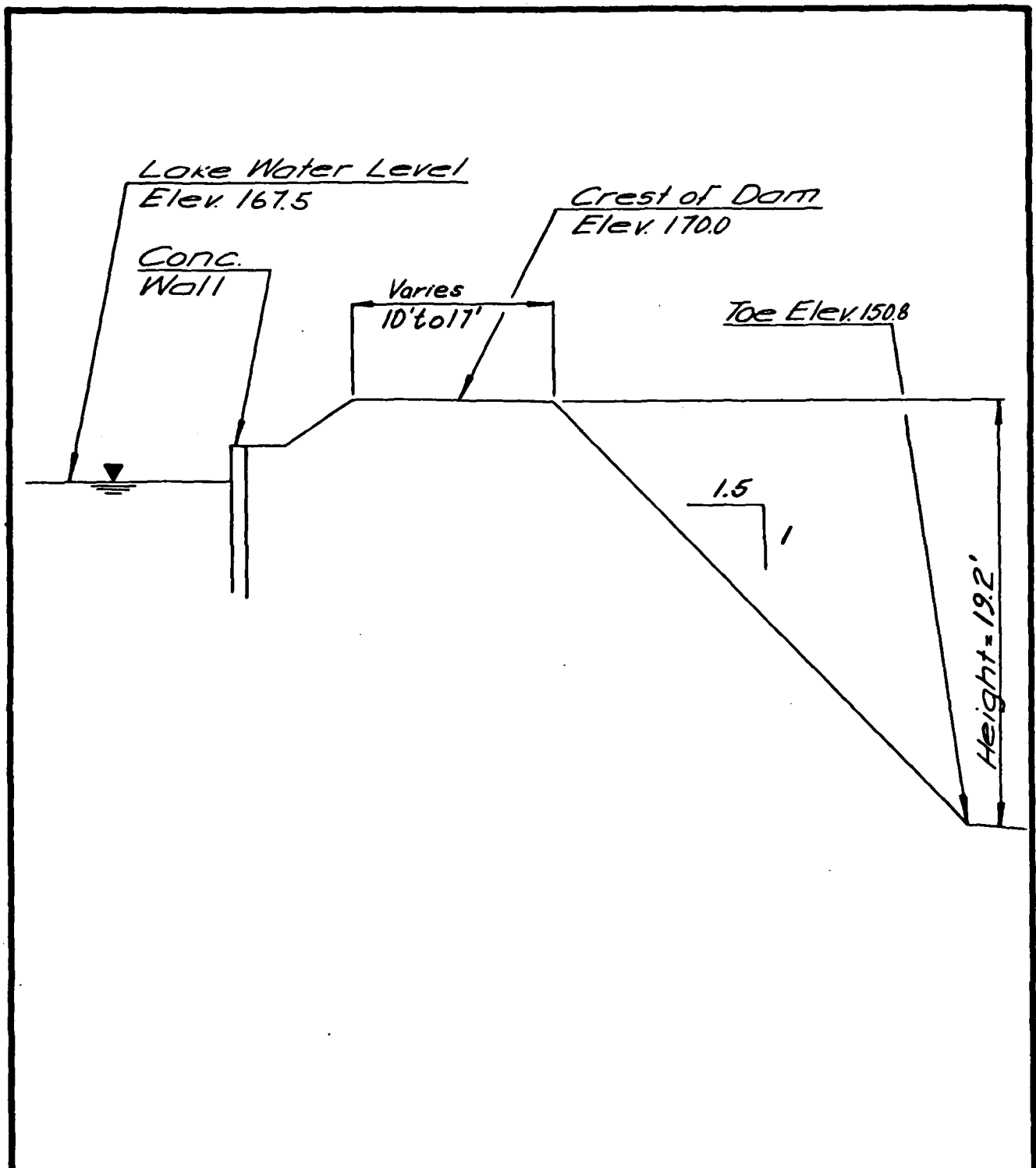


PLATE 6

STORCH ENGINEERS
 FLORHAM PARK, NEW JERSEY

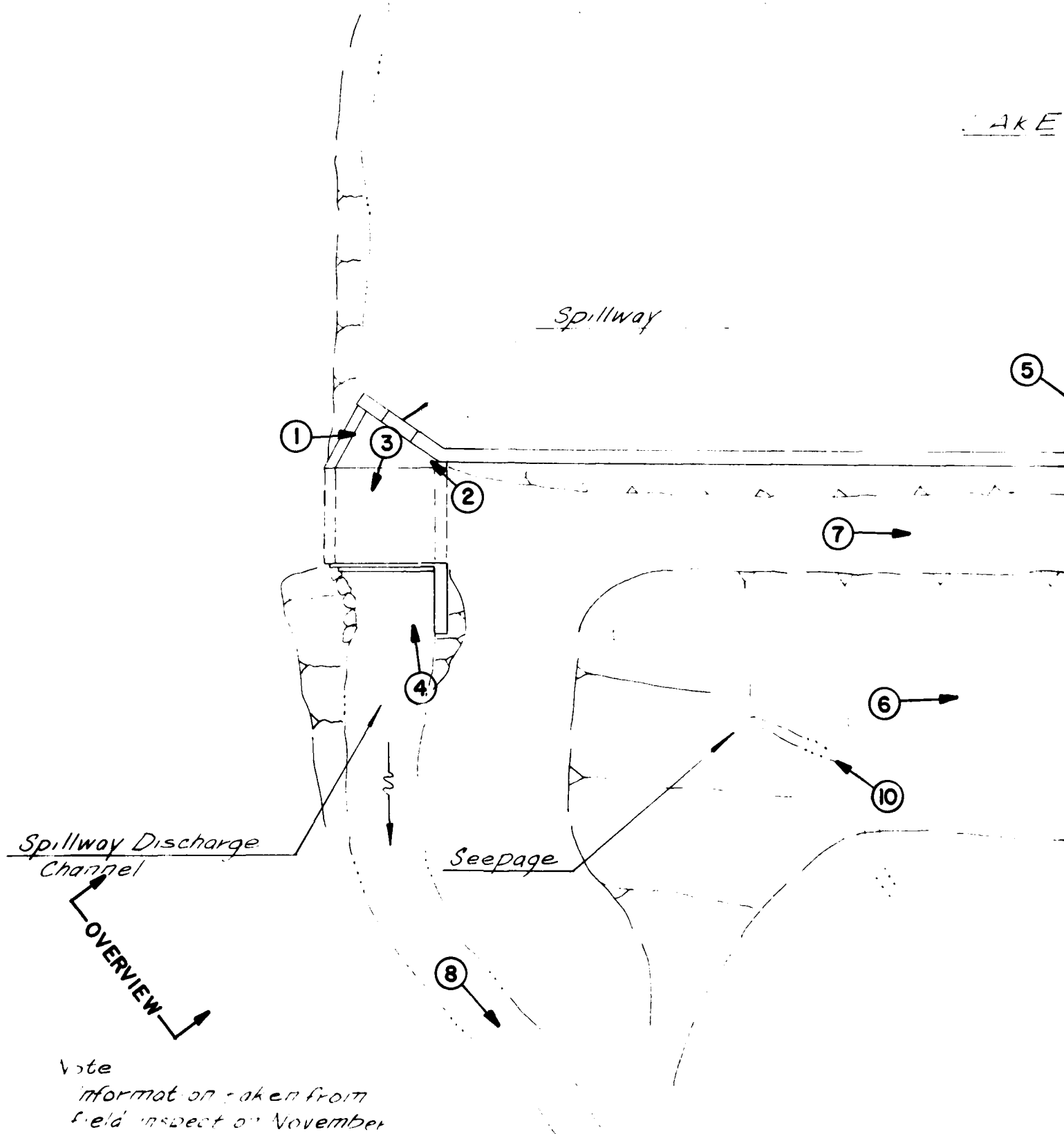
DIVISION OF WATER RESOURCES
 N.J. DEPT. OF ENVIR. PROTECTION
 TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS
 DAM SECTION
 AMWELL NO. 2 DAM

I.D. N.J. 00522

SCALE: NOT TO SCALE

DATE: JAN. 1980



Note
 Information taken from
 field inspection November
 19, 1979.

LAKE



⑤

Core No.

Crest of Dam

⑥

⑩

⑨

Seepage

PLATE 7

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN

AMWELL NO.2 DAM

I.D.N.J. 00522

SCALE NOT TO SCALE

DATE JAN. 1980

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List
Visual Inspection
Phase I

Name of Dam Amwell No. 2 Dam County Hunterdon State New Jersey Coordinators NJDEP

Date(s) Inspection 11/19/79 Weather P-Cloudy Temperature 60°F

Pool Elevation at Time of Inspection 167.5 M.S.L. Tailwater at Time of Inspection 164.3 M.S.L.

Inspection Personnel:

John Gribbin Alan Volle

Ronald Lai Thomas Miller

Richard McDermott

J. Gribbin Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Embankment extensively overgrown with trees and brush. Narrow foot path on crest. Trees vary in caliper up to 18 inches. Some animal holes noted.	Recommend removal of trees and brush and filling of animal holes.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Significant erosion noted at downstream side of concrete spillway discharge structure.	Recommend stabilizing eroded area.
ANY NOTICEABLE SEEPAGE	Two points of seepage noted on downstream side of embankment; one on the downstream face near the west end of the dam discharging at about 1.5 gal./min. the other at the toe at the east end of the dam discharging at about 1 gal./min.	Recommend seepage investigation.
STAFF GAGE AND RECORDER	None	
DRAINS	None observed.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	3-foot high mound observed at toe at approx. center of dam.	This could be due to movement or sloughing.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Possible sloughing at toe (see note above). Erosion noted on embankment adjacent to spillway discharge channel.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical: generally level Horizontal: generally straight Downstream face very steep: approx. 1 vert to 1.5 horiz. slope	
CONC. WALL	Concrete surfaces in generally satisfactory condition with some spalling. A rough edge is located along the wall 18 inches below the top - appears to be related to forming. Transverse cracks noted at 15 to 20 foot intervals, 1/8 to 1/4 inch wide.	Conc. wall forming upstream face could be protruding core wall.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	N.A.	No low level outlet observed.
INTAKE STRUCTURE	N.A.	
OUTLET STRUCTURE	N.A.	
OUTLET CHANNEL	N.A.	
GATE AND GATE HOUSING	N.A.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONC. WEIR	Concrete surfaces in generally satisfactory condition. Debris observed on crest.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	Concrete surfaces generally fair with some large cracks noted. Left training wall at downstream end of channel was leaning toward right end of dam.	
WALKWAY	Concrete surfaces in generally satisfactory condition. Timbers on downstream side were rotted and broken and partially obstructing discharge channel.	Concrete slab walkway spans spillway discharge channel. Slab supports earth graded flush with crest of embankment. Recommend renovation or removal of timbers.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	N.A.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Banks are generally wooded. Slope of south bank about 7:1, slope of north bank about 20:1.	
SEDIMENTATION	Soundings at the downstream end of the lake indicate little accumulation of sediment.	
STRUCTURES ALONG BANKS	Lake is undeveloped. No structures observed along the banks.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Downstream channel consists of 300-foot long stream discharging into a lake downstream from the dam. Stream contains little obstruction; but discharge channel is obstructed immediately downstream from spillway.	
SLOPES	Slopes of the stream banks are generally steep (5 horiz. to 1 vert.) and wooded.	
STRUCTURES ALONG BANKS	A few dwellings are located along the north shore of the downstream lake. A road bridge is located on the downstream channel of the lower lake approx. 2500 feet from the dam in question.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

REMARKS

ITEM

DAM - PLAN

SECTIONS

Not Available

SPILLWAY - PLAN

SECTIONS

DETAILS

Not Available

OPERATING EQUIPMENT
PLANS & DETAILS

OUTLETS - PLAN

DETAILS

CONSTRAINTS

DISCHARGE RATINGS

Not Available

HYDRAULIC/HYDROLOGIC DATA

RAINFALL/RESERVOIR RECORDS

Not Available

CONSTRUCTION HISTORY

Not Available

LOCATION MAP

Not Available

REMARKS

ITEM

DESIGN REPORTS

Not Available

GEOLOGY REPORTS

Not Available

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

Not Available

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

Not Available

POST-CONSTRUCTION SURVEYS OF DAM

Not Available

BORROW SOURCES

Not Available

ITEM	REMARKS
MONITORING SYSTEMS	None known
MODIFICATIONS	Not Available
HIGH POOL RECORDS	Not Available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not Available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Dam reportedly washed out in 1955. Written reports not available.
MAINTENANCE OPERATION RECORDS	Not available

APPENDIX 2

Photographs

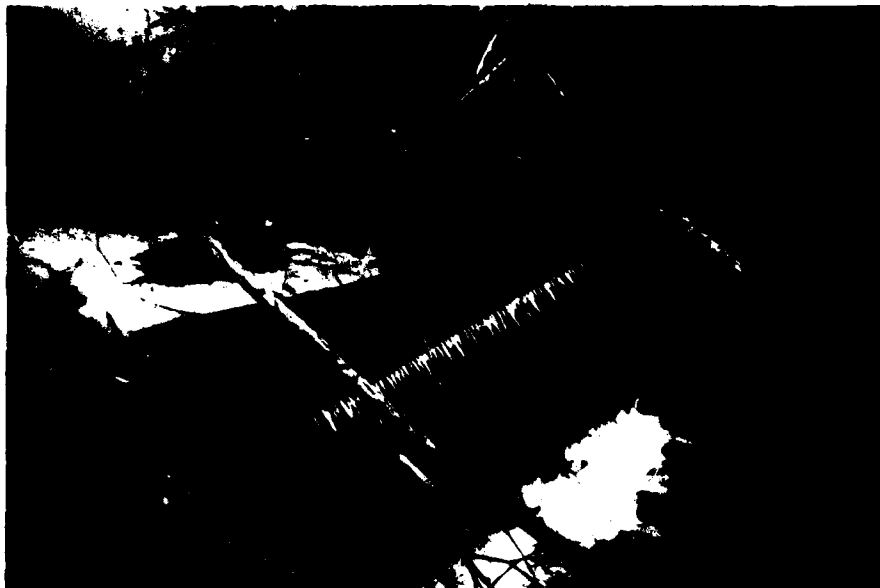


PHOTO 1

SPILLWAY CREST - LOOKING EAST

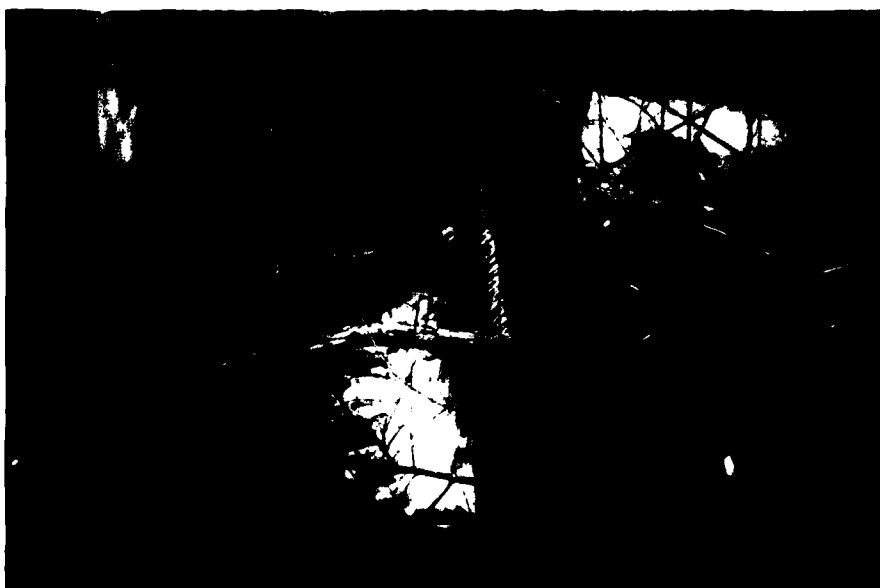


PHOTO 2

SPILLWAY CREST - LOOKING WEST

AMWELL NO. 2 DAM
9 NOVEMBER 1979

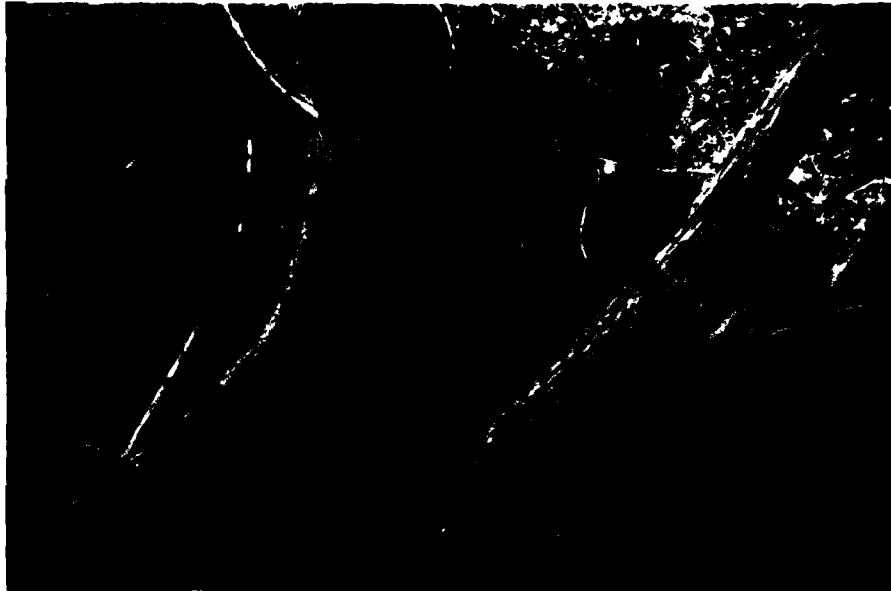


PHOTO 3

SPILLWAY DISCHARGE CHANNEL - UPSTREAM VIEW



PHOTO 4

SPILLWAY DISCHARGE CHANNEL - DOWNSTREAM VIEW

AMWELL NO. 2 DAM
9 NOVEMBER 1979



PHOTO 5

CONCRETE WALL ALONG UPSTREAM FACE OF DAM



PHOTO 6

DOWNSTREAM FACE OF DAM

AMWELL NO. 2 DAM
9 NOVEMBER 1979



PHOTO 7
CREST OF DAM



PHOTO 8
DOWNSTREAM CHANNEL

AMWELL NO. 2 DAM
9 NOVEMBER 1979



PHOTO 9

SEEPAGE AT TOE OF DAM - EAST END



PHOTO 10

SEEPAGE ON DOWNSTREAM FACE OF DAM NEAR SPILLWAY

AMWELL NO. 2 DAM
9 NOVEMBER 1979



PHOTO 9

SEEPAGE AT TOE OF DAM - EAST END



PHOTO 10

SEEPAGE ON DOWNSTREAM FACE OF DAM NEAR SPILLWAY

AMWELL NO. 2 DAM
9 NOVEMBER 1979

APPENDIX 3

Engineering Data

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: wooded, moderately steep terrain

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 167.5 (69 Acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 171.4

ELEVATION TOP DAM: Varies 170.0 to 171.0

SPILLWAY CREST: Straight concrete weir with notch

- a. Elevation Primary: 167.5, Secondary: 167.9
- b. Type Broad crested
- c. Width 1.6 feet
- d. Length Primary: 8 feet, Secondary: 12 feet
- e. Location Spillover Upstream of dam n/w end
- f. Number and Type of Gates None

OUTLET WORKS: None

- a. Type N.A.
- b. Location N.A.
- c. Entrance inverts N.A.
- d. Exit inverts N.A.
- e. Emergency draindown facilities: N.A.

HYDROMETEOROLOGICAL GAGES: None

- a. Type N.A.
- b. Location N.A.
- c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to top of dam) 223 c.f.s.
(Elev. 170.0)

APPENDIX 4

Hydraulic/Hydrologic Computations

STORCH ENGINEERS

Sheet 1 of 8

Project Amwell No. 2

Made By RL Date 1-9-80

1132C

Chkd By JG Date 1/25/80

HYDROLOGY

Hydrologic Analysis

Runoff hydrograph will be developed by
HEC-1-DB using triangular hydrograph with
The curvilinear transformation.

Drainage area = 0.9 mile²

Infiltration Data

Initial infiltration 1.5 in

Constant infiltration 0.15 in/hr

Time of Concentration

Vel. of overland flow by chart from SCS TR-55

Distance of overland flow 1600 ft at 1.8%

Distance of channel flow 4500 ft at 0.7%

$$T_c = \left(\frac{1600}{0.35} + \frac{4500}{1.2} \right) \frac{1}{3600}$$

$$= 2.2 \text{ hr.}$$

Project Amwell NO 2Made By RL Date 1-24-801132 CChkd By JG Date 1/25/80Time of Concentration

Kirpich

Pg 14-7. "Handbook of Applied Hydrology"

$$T_c = 0.00013 \frac{L^{0.77}}{S^{0.385}}$$

 T_c = time of concentration in hrs L = distance to basin divide S = average slope

$$T_c = 0.00013 \frac{(6100)^{0.77}}{(0.01)^{0.385}}$$

$$= \underline{\underline{0.63 \text{ hrs}}}$$

Time of Concentration

Lag time by Synders Method

$$t_p = C + (L L_c a)^{0.3}$$

$$= 2.0 (6100 \times 3000)^{0.3}$$

$$= \underline{\underline{1.76 \text{ hr}}}$$

Project Arkwell No. 2Made By RL Date 1-9-801132CChkd By JG Date 1/25/80Time of Concentration

by Kerby

Pg 14-36 "Handbook of Applied Hydrology" Chow ED.
McGraw Hill

$$t_c^{2.14} = \frac{2}{3} \frac{L\eta}{\sqrt{S}}$$

 t_c = time of concentration
in minutes L = Length of overland flow
in ft. S = Slope ft/ft η = 0.4 roughness coef.

$$t_c^{2.14} = \frac{2}{3} \frac{1600 (0.4)}{\sqrt{0.018}}$$

$$t_c = 0.72 \text{ hr. overland}$$

$$\text{Channel flow} = 0.96 \text{ hr}$$

$$T_c = 0.72 + 0.96$$

$$= \underline{1.7} \text{ hr}$$

Use $T_c = 1.7 \text{ hr}$ lag = 1 hr.
--

STORCH ENGINEERS

Sheet 4 of 8

Project

Amwell No 2

Made By

RL

Date

1-11-801132 C

Chkd By

JG

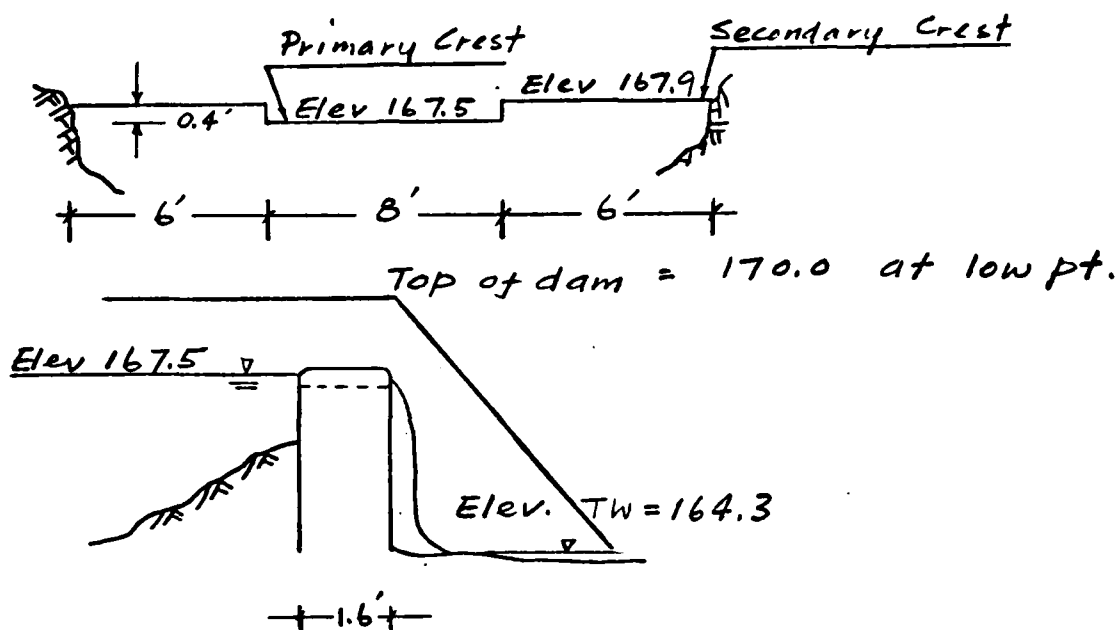
Date

1/25/80Lake Storage Volume

Elev (MSL)	Surface Area (AC)
148.3	0
167.5	11.9
180.0	47.8
200.0	128.6
220.0	252.5

HEC-1-DB will develop storage capacity
from surface area & elev.

Surface areas taken from USGS quadrangle.

HYDRAULICSSPILLWAY SECTIONS

$$Q = CLH^{3/2}$$

C values Pg 5-40
"Handbook of Hydraulics"
King Et. al.

Length of spillway

Primary 8'
Secondary 12'

Sample calculation

$$H = 3' \text{ Primary}$$

$$H_1 = 2.6' \text{ Secondary}$$

$$Q = 3.3 \times 8 \times 3^{3/2} \\ = 137.2 \text{ cfs}$$

$$Q_1 = 3.3 \times 12 \times 2.6^{3/2} \\ = 166 \text{ cfs}$$

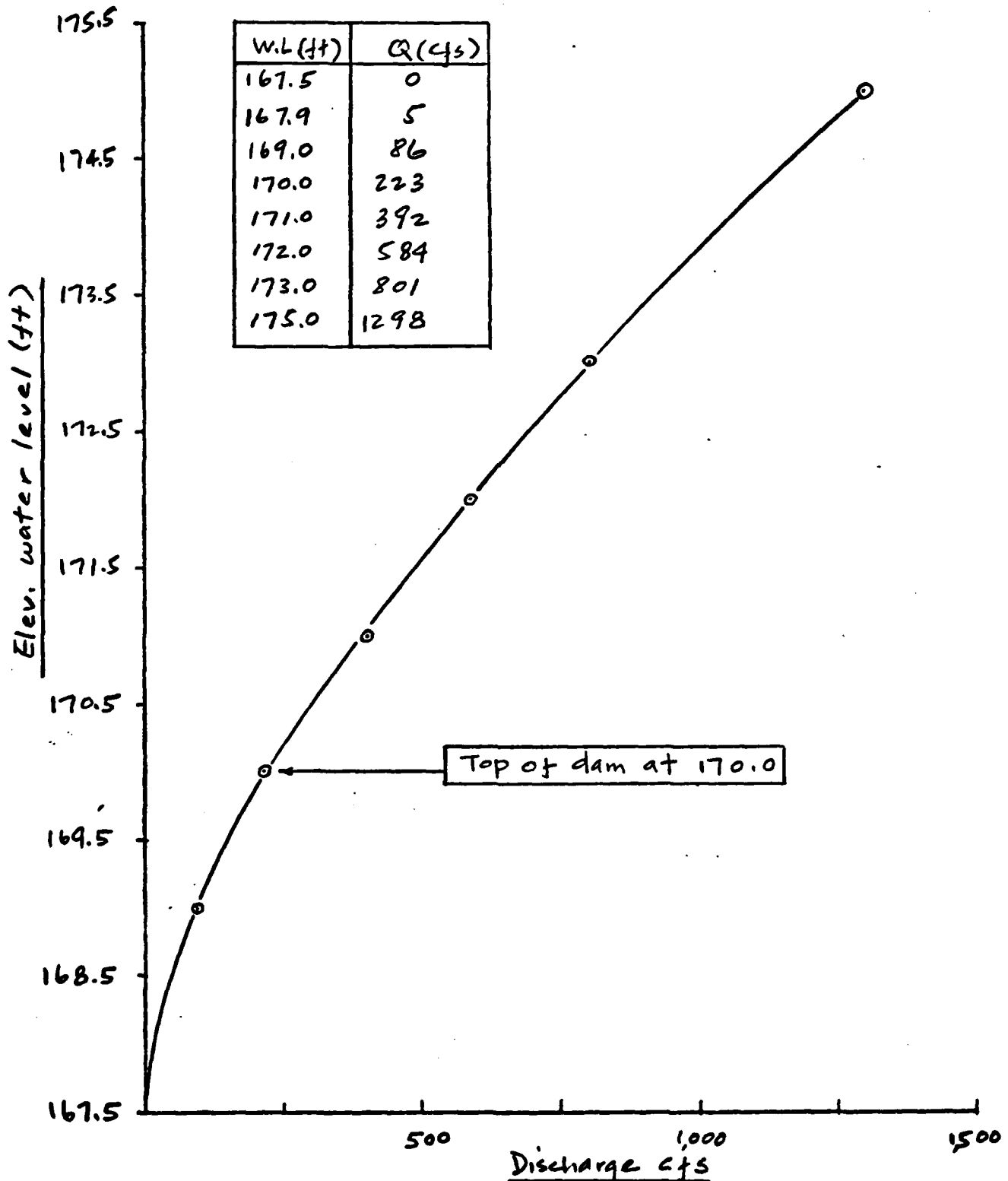
$$\Sigma Q = 137.2 + 166 = \underline{\underline{303.2 \text{ cfs}}}$$

STORCH ENGINEERS

Sheet 6 of 8Project Amwell No 2Made By RL Date 1-9-801132CChkd By JG Date 1/25/80STAGE DISCHARGE TABULATION

<u>Primary Crest</u>						<u>Secondary Crest</u>				
W.L. (ft)	H (ft)	$H^{3/2}$	L (ft)	C	Q (cfs)	H_1 (ft)	$H_1^{3/2}$	L_1 (ft)	Q_1 (cfs)	ΣQ (cfs)
167.5	0	0	8	0	0	0	0	12	0	0
167.9	0.4	0.25	8	2.14	5.3	0	0	12	0	5.3
169.0	1.5	1.84	8	3.0	44.2	1.1	1.15	12	41.4	85.6
170.0	2.5	3.95	8	3.28	103.6	2.1	3.04	12	119.7	223.3
171.0	3.5	6.55	8	3.32	174.0	3.1	5.46	12	217.5	391.5
172.0	4.5	9.55	8	3.32	253.6	4.1	8.3	12	330.7	584.3
173.0	5.5	12.9	8	3.32	342.6	5.1	11.5	12	458.2	800.8
175.0	7.5	20.5	8	3.32	544.5	7.1	18.9	12	753.0	1297.5

STORCH ENGINEERS

Sheet 7 of 8Project Amwell No 2
1132 CMade By RL Date 1-9-80Chkd By JG Date 1/25/80STAGE DISCHARGE CURVE

STORCH ENGINEERS

Sheet 8 of 8

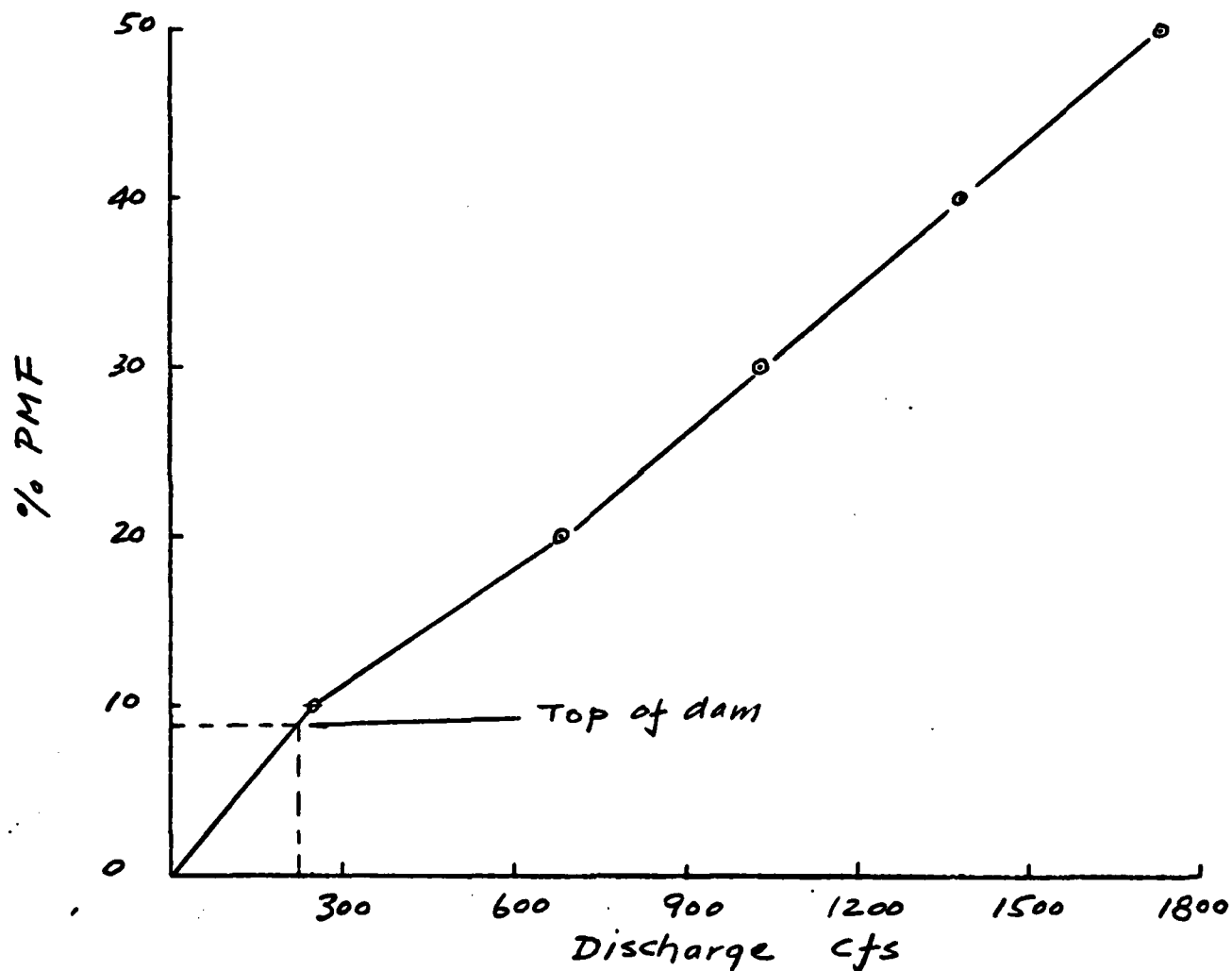
Project Amwell No 2

Made By RL Date 1-11-80

1132 C

Chkd By JG Date 1/25/80

Overtopping Potential



At top of dam, spillway capacity
is 9% of PMF or 18% of SDF

HEC-1-DB COMPUTATIONS

NATIONAL DAM SAFETY PROGRAM
AMWELL NO. 2 DAM NEW JERSEY
MULTI RATIO ROUTING

A1	150	5	1	0.3	0.2	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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 FLOOD HYDROGRAPH PACKAGE (MCS-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE# 80/01/09.
 TIME# 14.34.34.

NATIONAL DAM SAFETY PROGRAM
 AMWELL NO. 2 DAM
 MULTI-RATIO ROUTING

JOB SPECIFICATION									
NO	NMR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	10	0	0	0	0	0	3	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRATIO= 5 LRTIO= 1
 RTIOS= .50 .40 .30 .20 .10

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SUB-AREA RUNOFF COMPUTATION

SUBAREA INFLOW HYDROGRAPH TO AMWELL NO. 2 LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLI	JPRI	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA									
INVDG	IUMG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.90	0.00	.90	0.00	0.000	0	1	0

TRSPC COMPUTED BY THE PROGRAM IS .800

PRECIP. DATA									
SPFE	PMS	R6	R12	R24	R48	R72	R96		
0.00	26.00	100.00	109.00	117.00	0.00	0.00	0.00		

LOSS DATA										
LROPT	STKR	DLTKR	RTIOL	ERAIN	STKRS	RTIOK	SIRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

UNIT HYDROGRAPH DATA
 TC= 0.00 LAG= 1.00

RECESSION DATA
 STRTQ= -1.00 GRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 32 END OF PERIOD ORIGINATES, TC= 0.00 HOURS, LAG= 1.00 VOL= 1.00									
ST	END	PERIOD	ORIGINATES	TC	HOURS	LAG	VOL	RTIMP	RTIOK
27.	80.	164.	275.	360.	398.	42.	33.	33.	20.
188.	145.	112.	90.	70.	54.	4.	3.	25.	2.
15.	12.	7.	6.	4.	3.	4.	3.	25.	2.
1.	0.	0.	0.	0.	0.	0.	0.	20.	2.

MO-DA	HR-MN	PERIOD	RAIN	EXCS	LOSS	COMP 0
1.01	.10	1	.002	0.00	.002	1
1.01	.20	2	.002	0.00	.002	1
1.01	.30	3	.002	0.00	.002	1
1.01	.40	4	.002	0.00	.002	1
1.01	.50	5	.002	0.00	.002	1
1.01	.60	6	.002	0.00	.002	1
1.01	.70	7	.002	0.00	.002	1
1.01	.80	8	.002	0.00	.002	1
1.01	.90	9	.002	0.00	.002	1
1.01	1.00	10	.002	0.00	.002	1
1.01	1.10	11	.002	0.00	.002	1
1.01	1.20	12	.002	0.00	.002	1
1.01	1.30	13	.002	0.00	.002	1
1.01	1.40	14	.002	0.00	.002	1
1.01	1.50	15	.002	0.00	.002	1
1.01	1.60	16	.002	0.00	.002	1
1.01	1.70	17	.002	0.00	.002	1
1.01	1.80	18	.002	0.00	.002	1
1.01	1.90	19	.002	0.00	.002	1
1.01	2.00	20	.002	0.00	.002	1
1.01	2.10	21	.002	0.00	.002	1
1.01	2.20	22	.002	0.00	.002	1
1.01	2.30	23	.002	0.00	.002	1
1.01	2.40	24	.002	0.00	.002	1
1.01	2.50	25	.002	0.00	.002	1
1.01	2.60	26	.002	0.00	.002	1
1.01	2.70	27	.002	0.00	.002	1
1.01	2.80	28	.002	0.00	.002	1
1.01	2.90	29	.002	0.00	.002	1
1.01	3.00	30	.002	0.00	.002	1
1.01	3.10	31	.002	0.00	.002	1
1.01	3.20	32	.002	0.00	.002	1
1.01	3.30	33	.002	0.00	.002	1
1.01	3.40	34	.002	0.00	.002	1
1.01	3.50	35	.002	0.00	.002	1
1.01	3.60	36	.002	0.00	.002	1
1.01	3.70	37	.002	0.00	.002	1
1.01	3.80	38	.002	0.00	.002	1
1.01	3.90	39	.002	0.00	.002	1
1.01	4.00	40	.002	0.00	.002	1
1.01	4.10	41	.002	0.00	.002	1
1.01	4.20	42	.002	0.00	.002	1
1.01	4.30	43	.002	0.00	.002	1
1.01	4.40	44	.002	0.00	.002	1
1.01	4.50	45	.002	0.00	.002	1
1.01	4.60	46	.002	0.00	.002	1
1.01	4.70	47	.002	0.00	.002	1
1.01	4.80	48	.002	0.00	.002	1
1.01	4.90	49	.002	0.00	.002	1
1.01	5.00	50	.002	0.00	.002	1
1.01	5.10	51	.002	0.00	.002	1
1.01	5.20	52	.002	0.00	.002	1
1.01	5.30	53	.002	0.00	.002	1
1.01	5.40	54	.002	0.00	.002	1
1.01	5.50	55	.002	0.00	.002	1
1.01	5.60	56	.002	0.00	.002	1
1.01	5.70	57	.002	0.00	.002	1
1.01	5.80	58	.002	0.00	.002	1
1.01	5.90	59	.002	0.00	.002	1
1.01	6.00	60	.002	0.00	.002	1
1.01	6.10	61	.002	0.00	.002	1
1.01	6.20	62	.002	0.00	.002	1
1.01	6.30	63	.002	0.00	.002	1
1.01	6.40	64	.002	0.00	.002	1
1.01	6.50	65	.002	0.00	.002	1
1.01	6.60	66	.002	0.00	.002	1
1.01	6.70	67	.002	0.00	.002	1
1.01	6.80	68	.002	0.00	.002	1
1.01	6.90	69	.002	0.00	.002	1
1.01	7.00	70	.002	0.00	.002	1
1.01	7.10	71	.002	0.00	.002	1
1.01	7.20	72	.002	0.00	.002	1
1.01	7.30	73	.002	0.00	.002	1
1.01	7.40	74	.002	0.00	.002	1
1.01	7.50	75	.002	0.00	.002	1

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.40	76	.35	.32	.03	25.4
1.01	1.50	77	.35	.32	.03	25.4
1.01	2.00	78	.35	.32	.03	25.4
1.01	2.10	79	.42	.39	.03	59.7
1.01	2.20	80	.42	.39	.03	71.4
1.01	2.30	81	.42	.39	.03	81.3
1.01	2.40	82	.42	.39	.03	90.3
1.01	2.50	83	.42	.39	.03	98.9
1.01	3.00	84	.42	.39	.03	106.6
1.01	3.10	85	.52	.49	.03	112.3
1.01	3.20	86	.52	.49	.03	118.1
1.01	3.30	87	.52	.49	.03	124.3
1.01	3.40	88	.52	.49	.03	130.5
1.01	3.50	89	.52	.49	.03	136.8
1.01	4.00	90	.52	.49	.03	142.9
1.01	4.10	91	.47	.45	.02	148.5
1.01	4.20	92	.79	.77	.02	154.8
1.01	4.30	93	1.42	1.40	.02	161.7
1.01	4.40	94	1.56	1.53	.03	179.6
1.01	4.50	95	1.03	1.00	.03	210.0
1.01	5.00	96	.63	.61	.02	250.5
1.01	5.10	97	.49	.46	.03	280.3
1.01	5.20	98	.49	.46	.03	309.3
1.01	5.30	99	.49	.46	.03	338.0
1.01	5.40	100	.49	.46	.03	366.4
1.01	5.50	101	.49	.46	.03	394.7
1.01	6.00	102	.49	.46	.03	422.9
1.01	6.10	103	.38	.36	.02	451.0
1.01	6.20	104	.38	.36	.02	479.1
1.01	6.30	105	.38	.36	.02	507.2
1.01	6.40	106	.38	.36	.02	535.3
1.01	6.50	107	.38	.36	.02	563.4
1.01	7.00	108	.38	.36	.02	591.5
1.01	7.10	109	.03	.00	.03	619.6
1.01	7.20	110	.03	.00	.03	647.7
1.01	7.30	111	.03	.00	.03	675.8
1.01	7.40	112	.03	.00	.03	703.9
1.01	7.50	113	.03	.00	.03	732.0
1.01	8.00	114	.03	.00	.03	760.1
1.01	8.10	115	.03	.00	.03	788.2
1.01	8.20	116	.03	.00	.03	816.3
1.01	8.30	117	.03	.00	.03	844.4
1.01	8.40	118	.03	.00	.03	872.5
1.01	8.50	119	.03	.00	.03	900.6
1.01	9.00	120	.03	.00	.03	928.7
1.01	9.10	121	.03	.00	.03	956.8
1.01	9.20	122	.03	.00	.03	984.9
1.01	9.30	123	.03	.00	.03	1013.0
1.01	9.40	124	.03	.00	.03	1041.1
1.01	9.50	125	.03	.00	.03	1069.2
1.01	10.00	126	.03	.00	.03	1097.3
1.01	10.10	127	.03	.00	.03	1125.4
1.01	10.20	128	.03	.00	.03	1153.5
1.01	10.30	129	.03	.00	.03	1181.6
1.01	10.40	130	.03	.00	.03	1209.7
1.01	10.50	131	.03	.00	.03	1237.8
1.01	11.00	132	.03	.00	.03	1265.9
1.01	11.10	133	.03	.00	.03	1294.0
1.01	11.20	134	.03	.00	.03	1322.1
1.01	11.30	135	.03	.00	.03	1350.2
1.01	11.40	136	.03	.00	.03	1378.3
1.01	11.50	137	.03	.00	.03	1406.4
1.01	12.00	138	.03	.00	.03	1434.5
1.01	12.10	139	.03	.00	.03	1462.6
1.01	12.20	140	.03	.00	.03	1490.7
1.01	12.30	141	.03	.00	.03	1518.8
1.01	12.40	142	.03	.00	.03	1546.9
1.01	12.50	143	.03	.00	.03	1575.0
1.01	13.00	144	.03	.00	.03	1603.1
1.01	13.10	145	.03	.00	.03	1631.2
1.01	13.20	146	.03	.00	.03	1659.3
1.01	13.30	147	.03	.00	.03	1687.4
1.01	13.40	148	.03	.00	.03	1715.5
1.01	13.50	149	.03	.00	.03	1743.6
1.01	14.00	150	.03	.00	.03	1771.7
1.02	1.00	151	.03	.00	.03	1800.0
SUM			24.34	20.54	3.80	72861.
			(618.)	(522.)	(96.)	(2063.19)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
CFS	3559.	1614.	506.	486.		72856.
CMS	101.	51.	14.	14.		2063.
INCHES		18.75	20.92	20.92		20.92
MM		476.29	531.28	531.31		531.31
AC-FT		200.	1003.	1004.		1004.
THOUS CU M		1110.	1238.	1238.		1238.

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
CFS	1776.	987.	253.	243.		36428.
CMS	50.	26.	7.	7.		1032.
INCHES		9.38	10.46	10.46		10.46
MM		238.15	265.64	265.65		265.65
AC-FT		450.	502.	502.		502.
THOUS CU M		555.	619.	619.		619.

ROUTE DISCHARGE THRU DAM

[illegible]

STATION DAM, PLAN 1, RATIO 1

[illegible]

TFLOW IS 1731. AT TIME 16.67 HOURS

SUMMARY OF DAM SAFETY ANALYSIS

.....	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 167.50 69. 5.	SPILLWAY CREST 167.50 69. 0.	TOP OF DAM 170.00 106. 223.	DURATION OVER HOURS	TIME OF MAX HOURS	TIME OF FAILURE HOURS
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	MAXIMUM OUTFLOW HOURS	MAXIMUM OUTFLOW HOURS	MAXIMUM OUTFLOW HOURS
.50	171.41	1.41	132.	1731.	5.43	16.67	0.00
.40	171.18	1.18	127.	1381.	5.50	16.83	0.00
.30	170.91	.91	122.	1033.	4.83	16.83	0.00
.20	170.61	.61	116.	681.	3.50	16.83	0.00
.16	170.07	.07	107.	247.	.83	17.33	0.00

APPENDIX 5

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